

THREE NEW ANNUAL SPECIES OF *ECHINOCHLOA* FROM NORTHERN AUSTRALIA

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ABSTRACT

Michael, P. W. (Department of Agronomy and Horticultural Science, University of Sydney, New South Wales, Australia, 2006) and Joyce W. Vickery (National Herbarium of New South Wales, Royal Botanic Gardens, Sydney, New South Wales, 2000) 1980. Three New Annual Species of *Echinochloa* from Northern Australia. *Telopea* 2 (1): 25-29.—*Echinochloa kimberleyensis* Michael et Vickery, *E. macraudra* Michael et Vickery and *E. elliptica* Michael et Vickery are described.

In our examination of Northern Australian specimens of *Echinochloa* previously assigned to *E. stagnina* (Retz.) Beauv. in Australian herbaria, it became clear that three undescribed taxa were included. The three taxa described here are tall annual grasses growing in wet places.

Echinochloa kimberleyensis Michael et Vickery, sp. nov.

Gramen annuum usque ad 2 m altum. Ligulae foliorum summorum brevissime ciliatae foliorum inferiorum glabrae vel vix ciliatae. Spiculae 5-7.5 mm longae anguste ellipticae longe aristatae versus basim leniter deerescentes. Gluma superior breviter stipitata. Flosculus inferior neuter. Palea inferior angusta ad dimidium lemmatis attingens raro nulla. Antherae flosculi superioris 1.5-2.1 mm longae. Caryopsis alba.

HOLOTYPE, WESTERN AUSTRALIA: grown at Kimberley Research Station, *E. C. B. Langfield* 211, dispatched 10.1950 (CANB 24391). ISOTYPE: CANB 24391a.

Rather light green, erect annual up to c. 2 m high. Culms mostly concealed by the leaf-sheaths, smooth, glabrous, furrowed but otherwise more or less terete, compressible, moderately coarse and up to 5 mm in diameter towards the base, diminishing upwards, about 5-noded above the base. Nodes glabrous. Sheaths much longer than the internodes, striate, smooth, glabrous, rather loose upwards, somewhat keeled upwards, greenish to pallid, the lowest sometimes slightly pinkish, the margins with a few stiff, long, tubercle-based cilia near the junction with the blade. Ligules of the upper leaves shortly and rather sparsely ciliate with the cilia 0.25-1.0 mm long, those of the lower leaves decreasingly so or entirely glabrous, the collar sometimes pubescent. Blades linear, flat, the lower rather narrow and about 4-6 mm wide, the upper broader and up to 16 mm broad, scabrous on the margins and with distant, long, very stiff setulose hairs on the thickened, whitish, scabrous margins especially near the junction with the sheath, light green, finely long-acuminate, shortly to rather abruptly narrowed into the sheath at the base, finely and densely scaberulous on both surfaces, the rather narrow midrib prominent with 3-6 primary nerves on each side of it. Panicle at length exerted, erect or somewhat drooping, linear to very narrowly lanceolate, up to 25 cm long, with long, appressed or narrowly divergent branches loosely clothed with long-awned spikelets, the main axis terete towards the base, upwards becoming angular-triquetrous, prominently striate, closely long-scabrous on the angles and ridges upwards and with dense long setae at the nodes, the lower branches rather distant, c. 7 cm long, with short secondary branches towards the base, the rachis compressed-triquetrous, very scabrous and with rather numerous, long, tubercle-based, branch setae, the pedicels 0.25-1.25 mm long, cupular-diseoid at the apices. Spikelets 5-7.5 mm long, narrowly elliptical, narrowing evenly towards the extremely short constricted base, long-awned, not turgid, pale greenish, the glumes and lower lemma membranous-herbaceous. Lower glume

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about half as long as the spikelet, 3-nerved with the middle nerve rather evident and the lateral nerves less so, acute to acuminate, scabrous on the nerves and scarcely so between them, finely and shortly but stiffly ciliolate on the margins, embracing the base of the spikelet, not or scarcely inflated above the not or extremely shortly constricted base. Upper glume minutely stipitate above the lower glume, the shape and size of the spikelet, convex on the back, acuminate, long- cuspidate, scabrous to shortly spinulose on the nerves with the spinules rarely exceeding 0.3 mm in length, distantly scabrous between the nerves, 7-nerved with the nerves manifest at least near the apex. Lower floret sterile: Lemma similar to the upper glume but flat or lightly depressed on the back, 5-nerved, shortly spinulose on the nerves with the spinules rarely exceeding 0.3 mm in length, very distantly scabrous or almost smooth between them, long-acuminate passing into a pale, strong, scabrous awn up to 8.5 cm long; palea firmly hyaline, much narrower than and often only half the length of the lemma, finely ciliolate on the keels upwards, sometimes absent. Upper floret hermaphrodite, 5-6.5 mm long, narrowly elliptical, planoconvex, pale greenish or yellowish: lemma thinly crustaceous, convex on the back, very obscurely 5-nerved, cuspidate to rather long-cuspidate, the smooth shining back passing evenly into the scabrous cusp, occasionally (perhaps as an abnormality) the cusp extending into an awn up to 4 cm in length; palea similar to the lemma in texture, flat on the back, almost as long as the body of the lemma, the curving sides embracing the flower, the margins slightly thinner, broader towards the base. Anthers 1.5-2.1 mm long, yellow, grain oblong elliptical, 2.75-3.5 mm long, 1.5-1.75 mm wide, creamy-whitish, not strongly turgid, the embryo one-half to three-fifths as long.

DISTRIBUTION: Often growing in dense stands in and on the edge of swamps along the Ord River, Victoria River in north western Australia and in the Cook District of Queensland.

SPECIMENS EXAMINED: QUEENSLAND: Cook District: 24 miles [39 km] NW. of Strathmore Station, dominant on edge of swamp, *M. Lazarides 3913A in part*, 8.1953 (CANB); Forest Home Station, very abundant in swamps, *L. J. Brass 1886*, 4.1931 (BRI, CANB, K). WESTERN AUSTRALIA: Milligans Lagoon, East Kimberleys, shorter growing than *Oryza fatua*, 7 ft [2.1 m] high, base of stem red, *E. C. B. Langfield 211*, 4.1950 (BRI, CANB); Martins Swamp, East Kimberley, in black soil swamp in 2 ft [0.6 m] of water *E. C. B. Langfield 211*, 10.4.1950 (PERTH); Martins Swamp, 6 miles [10 km] NW of Kimberley Research Station, swampy localities, growing very heavily in large areas, apparently native, base of stem red for up to 6 in (15 cm), *E. C. B. Langfield H, 7.1952* (CANB); near Kimberly Downs Station, co-dominant with *Leptochloa brownii* in heavy soil depression of flood out plain, *M. Lazarides 6593A*, 6.1961 (CANB). NORTHERN TERRITORY: Victoria River, [probably *F. Mueller*, 10.1855] (MEL).

Material of this species was identified as *E. stagnina* (Retz.) Beauv. by Blake (1952) who cited the specimens from Forest Home Station and Milligans Lagoon.

E. kimberleyensis superficially resembles *E. oplismenoides* (Fourn.) Hitchc. of Mexico which, however, has much less dense panicles and blackish anthers only about 0.6 mm long.

The spikelets of *E. kimberleyensis* have much in common with those of *Echinochloa crus-galli* (L.) Beauv. var. *bealananensis* A. Camus, of Madagascar. The Holotype of the latter (Marais de Bealanana, bords de rivières, Centre-Nord, Vernac: Karengy, leg. H. Humbert & R. Capuron [P]), which we have examined, shows a plant with robust lower culms 8-10 mm diameter very strongly rooted at the lower nodes suggesting that it was somewhat horizontal (and rhizome-like) at the base. The culm is about 1.5 m long to the tip of the 37 cm long inflorescence; the lower branches of the latter are up to 12 cm long. The spikelets are all immature and, at this stage at least, appear a little shorter and flatter than those of *E. kimberleyensis*. Ligules on all the leaves present are strongly ciliate with the cilia 1-3 mm long. The blades do not bear stiff, strongly tubercle-based, spinulose hairs on the margins towards the base, and are not densely scabrous on the surfaces. The anthers are blackish and about 1 mm long.

We have concluded therefore that *E. kimberleyensis* and *E. crus-galli* var. *bealananensis* are not conspecific. Incidentally the latter is clearly entirely distinct from *E. crus-galli*.

Echinochloa macrandra Michael et Vickery, sp. nov.

E. kimberleyensis Michael et Vickery affinis sed ligulis omnibus dense ciliatis, spiculis latioribus ad basim anguste truncatis, flosculo inferiore masculino, palea inferiore latiore longiorque, antheris 2.5–2.8 mm longibus.

HOLOTYPE: WESTERN AUSTRALIA: "The Razorbacks", near 65 mile peg on Wyndham—Darwin road, Kimberley, swamp on heavy grey clay, annual in damp mud, seed voucher (CSIRO Accession No. W662), *N.T. Burbidge 5185*, 17.4.1956 (CANB 35478). ISOTYPE: CANB 35480.

Tall erect annual, 0.8–2 m high, rooting in mud. Culms simple or sparsely branching, moderately stout and up to 6 mm in diameter towards the base, more slender upwards, yellowish, terete, somewhat compressible, coarsely and rather distantly striate, smooth, glabrous, 6- to 7-noded, often mostly concealed by the leaf-sheaths. Nodes glabrous. Sheaths often longer than the internodes, greenish or pinkish, smooth or subsmooth, lightly striate, glabrous except sometimes fringed with long, fine, tubercle-based hairs on the margins near the apex, often keeled upwards, the lower very broad, becoming loose around the culm and thinly sub-membranous. Ligules of both upper and lower leaves shortly but rather densely ciliate with fine cilia 1–1.5 mm long, the collar pubescent. Blades linear, flat, up to 25 cm long and 12 mm broad, tapering to an acuminate or long-acuminate apex, rounded into the sheath at the base, often scabrous on the nerves and otherwise smooth or minutely scaberulous, sometimes pinkish on drying, sometimes with a few very long, stiff, tubercle-based hairs on the margins near the base, with a manifest but narrow, whitish midrib and about 6 primary nerves on each side of it, the margins whitish, thickened, scabrous. Panicle exserted, erect, more or less lanceolate in outline with the lower branches erectly or somewhat loosely spreading, the upper branches more erect, the main axis terete below and becoming angular-triangular upwards, closely scabrous with numerous nodal setae, the lower branches somewhat distant and up to 7 cm long, the upper shorter and more approximate, all rather loosely clothed with spikelets, the rachis of the raceme simple or with few short branchlets towards the base, triquetrous, scabrous, with rather few branch setae, the spikelets mostly binate on scabrous pedicels 0.5–1 mm long with discoid apices. Spikelets pale greenish, about 6 mm long, elliptical, slightly and very shortly rounded to constricted at the base or sessile, usually long-awned, not very turgid, the glumes and lower lemma membranous-herbaceous. Lower glume one-half to two-thirds as long as the spikelet, acute to acuminate, 5-nerved, scabrous on the nerves and very lightly scabrous between them, embracing the base of the spikelet, very slightly inflated above the extremely shortly constricted base. Upper glume as long as the spikelet and similar in outline, 5- to 7-nerved, convex on the back, acuminate to long-caudate or tapering into an awn up to 1 cm in length, lightly scabrous, scabrous-spinulose on the nerves with the spinules scarcely exceeding 0.3 mm in length. Lower floret staminate: lemma similar to the upper glume in outline but flat or lightly depressed on the back, 7-nerved, tapering into a scabrous awn 2–9 cm long, scabrous-spinulose on the nerves with the spinules rarely exceeding 0.4 mm in length, rather lightly scabrous between the nerves; palea oblong, rather broad, hyaline, almost as long as the lemma. Anthers (2–) 2.5–2.8 mm long, bright orange-yellow. Upper floret hermaphrodite, elliptical, 4.5–5 mm long including the short caudate tip, smooth, shining, planoconvex: lemma thinly crustaceous, convex on the back, tapering gradually into and slightly scabrous towards the scabrous tip, obscurely 5-nerved, lightly and obscurely striolate; palea similar to the lemma in texture and almost as long but flat on the back, the broadly curving sides thinner towards the margins and slightly broader towards the base, embracing the grain. Grain elliptical-oblong, 3.0–3.1 mm long and 1.75–1.9 mm broad, whitish to pale brownish, somewhat flattened and not very turgid, the embryo about three-fifths as long.

DISTRIBUTION: Occurs naturally only in swampy areas near the Ord River in Western Australia.

SPECIMENS EXAMINED: WESTERN AUSTRALIA: herbaceous swamp within sandy savannah country 5 km SSE. of Kununurra (15° 49' S, 128° 45' E), common grass in shallow water, *K. Pajmans* 2318, 3.1978 (CANB). CULTIVATED: AUSTRALIAN CAPITAL TERRITORY: Canberra, cult. from seed from N.W. Australia coll. N. T. Burbidge (CSIRO Accession No. W662), *P. Michael*, 3.1968 (CANB). JAPAN: cult. from seed from near the Ord River, Kimberley Division, Western Australia coll. N. T. Burbidge (CSIRO Accession No. W662), annual, non-floating ($n = 54$, *T. Yabuno* (K).

This annual species has been examined in detail by Yabuno (1968, 1968a, 1970) who used the seed collected by Dr Burbidge (CSIRO Accession No. W662) as experimental material. In terms of habit, genetic constitution and breeding behaviour he recognized it as distinct from perennial species known as *E. stagnina*. He has shown that it is 12-ploid ($2n = 108$; $x = 9$).

Echinochloa elliptica, *Michael et Vickery*, sp. nov.

Gramen annum usque ad 1.5 m altum. Vaginae tuberculato-setosae. Ligulae plerumque breviter ciliatae. Paniculae erectae contractae fusiformes, usque ad 15 cm longae. Spiculae 4-4.5 mm longae anguste ellipticae stipitatae aristatae. Flosculus inferior neuter. Antherae flosculi superioris 0.75-1 mm longae. Caryopsis albidus.

HOLOTYPE: NORTHERN TERRITORY: Coastal Plains Research Station, 30 miles SE of Darwin, common on heavy soil banks of rice bays, tufted, erect perennial 3-4 ft high, *M. Lazarides* 6805, 13.3.1963 (CANB 135762). ISOTYPES: K, NT 22337.

Slender to moderately robust annual up to 1.5 m high, erect or somewhat geniculate and occasionally rooting at the lower nodes, rather light green. Culms simple or branching, compressible, terete or slightly compressed, striate, smooth or subsmooth, about 6-noded. Nodes glabrous. Sheaths mostly longer than the internodes, often rather loose, strongly compressed and keeled upwards, striate, sprinkled with stiff, adpressed or divergent, tubercle-based hairs and otherwise finely pubescent, or glabrous. Ligule finely ciliate at least on the lower and median leaves with the cilia about 1 mm long, the collar often somewhat pubescent. Blades linear, flat, up to 15 cm long, 5-10 mm broad, attenuate to a long-acuminate apex, at the base narrowed rather abruptly into the sheath, lightly or rather closely sprinkled with slender tubercle-based hairs on both surfaces and the lower surface also pubescent, or more or less glabrous, the midrib conspicuous, whitish, with about 7 primary nerves on each side of it, the margins whitish and conspicuously thickened, scabrous and often with a few long, stiff, tubercle-based hairs near the base. Panicle erect, often more or less enclosed at the base in the uppermost sheath, linear, contracted and compact, spindle-shaped, up to 15 cm long, rather dense with numerous short, erect or very narrowly spreading and overlapping branches, the main axis more or less concealed by the branches, striate, terete below, becoming angular-triquetrous above, closely scabrous especially on the ridges and angles, with numerous setae at the nodes; lower racemes up to 4 cm long, the upper diminishing in length upwards, more or less simple, moderately densely clothed on one side with usually binate spikelets, the rachis triquetrous, scabrous, furnished with moderately numerous branch setae, the pedicels about 0.5-0.75 mm long, scabrous, cupular-discoid at the apices. Spikelets 4-4.5 mm long, 1.5 mm broad, rather narrowly elliptical above a manifestly constricted, about 0.4 mm long, stipe-like base, acuminate, awned, narrowly truncate above the stipe-like base, pale greenish, the glumes and lower lemma membranous-herbaceous. Lower glume usually about half as long as the spikelet, acute to acuminate, 3-5-nerved, scabrous on the nerves and more finely and distantly scabrous between them, embracing and often slightly inflated around the base of the spikelet, rather sharply constricted at the base, often minutely ciliate on the margins, rarely long-acuminate and almost as long as the spikelet. Upper glume the size and outline of the spikelet, convex on the back, acuminate-caudate or sometimes produced into a short awn up to 10 mm long, 5-nerved, shortly spinulose on the nerves with erect or erectly spreading spinules rarely exceeding 0.3 mm in length, rather sparsely scabrous between the nerves. Lower floret sterile: lemma similar to the upper glume but flat or lightly depressed on the back,

5 (-7)-nerved, shortly spinulose on the nerves with the spinules rarely more than 0.5 mm long, smooth or lightly scabrous between the nerves, attenuate into an awn about 6-30 mm long, or awnless and acuminate; palea hyaline, lanceolate, almost as long as the fertile floret. Upper floret hermaphrodite, rather narrowly elliptical, 3-4 mm long, 1.4 mm broad, smooth and shining, gradually narrowed into a short scabrous cusp: lemma thinly crustaceous, convex on the back, obscurely 5-nerved; palea almost as long as the lemma, similar in texture, flat on the back or somewhat bulging over the mature grain in the middle, the broadly curving sides embracing the grain, thinner towards the margins and broader towards the base. Anthers 0.75-1 mm long, pale to deep yellow. Grain 1.9-2.3 mm long, 1.4 mm wide, oblong-elliptical, whitish, the embryo about three-fifths as long, the margins of the narrow scutellum obscurely differentiated from the endosperm.

DISTRIBUTION: Occurs in heavy black soil on the plains of Adelaide River, on the Coastal Plain of Northern Territory, and along the Ord River in Western Australia: weedy in experimental rice fields.

SPECIMENS EXAMINED: NORTHERN TERRITORY: Bombing Range, Darwin, *N. Byrnes* 2054, 2.1971 (CANB, NSW, NT); Coastal plain, $\frac{1}{2}$ mile [0.8 km] from E. Cannon Hill Airstrip, black cracking clay soil, *P. Martensz* AE765, 2.1973 (CANB); Bankers Jungle, Koolpinyah, *F. W. Hely* H52, 1943 (CANB); Humpty Doo, black soil plains, *D. Tulloch* 3.1958 (CANB, NT); Humpty Doo—Adelaide River area, in rice fields, *J. D. Moir* 22, 1.1959 (CANB); Humpty Doo, shallow water, *H. S. McKee* 8336, 2.1961 (CANB, K, NSW, NT); Humpty Doo, *S. Aldrick* 2.1971 (CANB, NSW, NT); Humpty Doo, *H. J. Frith* 2.1956 (NSW); Humpty Doo, *W. Poggendorff* 5.1955 (NSW); Outer Litchfield, Humpty Doo, *S. J. J. Davies* 2.1958 (BRI); cult. from soil from Adelaide River, *N. Byrnes* 1492, 2.1969 (NT); Humpty Doo Exp. Rice Farm, growing in 6 in [15 cm] water in rice paddy, 3 ft [0.9 m] high (CANB); Humpty Doo rice fields, robust grass to 5 ft [1.5 m] high, growing on banks of rice bays, *J. Must* 650, 1.1971; Elliott-Lake Woods, *R. A. Perry* 278, 7.1947 (CANB); 20 miles [32 km] SW. of Elliott, *R. A. Perry* 270, 7.1947 (CANB). WESTERN AUSTRALIA: shallow swamp in plain of Ord River at foot of Wedge Hills, 15 km ENE. of Wyndham, 15° 29' S, 128° 16' E, probably subject to occasional brackish flooding in wet season, *K. Pajmans* 2275, 3.1978 (CANB); herbaceous swamp in plain of Ord River, 30 km NW. of Kununurra, 15° 33' S, 128° 33' E, grass very common in about 30 cm water, *K. Pajmans* 3.1978 (CANB). CULTIVATED: AUSTRALIAN CAPITAL TERRITORY: Canberra, cult. from seed collected near Darwin, N.T., *P. Michael* 3.1968 (CANB).

Of the new species described here, *E. elliptica* is perhaps the most distinctive. Its compact, spindle-shaped panicle is unique in the genus. It is the only one of these three presumably native Australian species that has so far shown any weedy propensity.

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